Cypress Semiconductor
Product Qualification Report

QTP# 082201 VERSION *A
July 2014

PSoC™ Neon Device Family S4AD-5 Technology, GSMC	
CY8C22045 CY8C22545 CY8C22345 CY8C21345	Mixed Signal Array

FOR ANY QUESTIONS ON THIS REPORT, PLEAE CONTACT
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PRODUCT QUALIFICATION HISTORY

Qual Report		Description of Qualification Purpose		Date Comp
060605		Qualify GSMC using PsoC Device Product Family on S4AD-5 Technology		Aug 06
082201		NEON 8C22045A Qualification on S4AD-5 Technology, Fab5		Oct 08
084611		NEON 8C22045A Mask Change (Rev B Silicon) Qualification on S4AD-5 Technology at GSMC Fab5		Jan 09
085103		NEON 8C22045A Mask Change (Rev C Silicon)Qualification on S4AD-5 Technology at GSMC Fab5		Feb 09

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualify NEON 8C22045A on S4AD-5 Technology, Fab5	
Marketing Part #:	CY8C22545-24AXI, CY8C22345-24SXI, CY8C21345-24SXI, CY8C22045-24PVXI
Device Description:	CY8C22X45 and CY21345 PSOC® MIXED SIGNAL ARRAY
Cypress Division:	Cypress Semiconductor – China Business Division

TECHNOLOGY/FAB PROCESS DESCRIPTION S4AD-5			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 250A TiN/5,800A Al/700A TiN Metal 2: 500A TiN/8,000A Al/250A TiN
Passivation Type and Materials:			7000A TeOs / 6000A Si3N4
Generic Process Technology/Design Rule (µ-			1P2M / 0.35um
Gate Oxide Material/Thickness (MOS):			SiO_2 / 110A
Name/Location of Die Fab (prime) Facility:			GSMC/Shanghai-China
Die Fab Line ID/Wafer Process ID:			S4AD-5 GSMC SONOS

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY SITE FACILITY
TQFP44, SOIC28, SOIC28, SSOP56	JCET-JT
TQFP44	ASE-G
SSOP56	CML-RA

Note: Package Qualification details upon request.

MAJOR PACKAGE INFORMATION FOR THIS QUALIFICATION	
Package Designation:	AZ44
Package Outline, Type, or Name:	44-Lead Thin Quad Flat pack (TQFP)
Mold Compound Name/Manufacturer:	KEG6000DA-CY
Mold Compound Flammability Rating:	V-0 PER UL-94
Mold Compound alpha Emission Rate:	0.005 CPH/cm Max
Oxygen Rating Index:	NA
Lead Frame Material:	Copper
Lead Finish, Composition / Thickness:	NiPdAu
Die Backside Preparation Method/Metallization:	Backgrind
Die Separation Method:	100% Saw
Die Attach Supplier:	Henkel
Die Attach Material:	QMI-509
Die Attach Method:	Epoxy
Bond Diagram Designation:	001-46350
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au. 0.9 mil
Thermal Resistance Theta JA °C/W:	61.68 °C/W
Package Cross Section Yes/No:	N/A
Name/Location of Assembly (prime) facility:	CML-R
MSL Level	3
Reflow Profile	260C

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	**CML-R, KYEC**

Note: Please contact a Cypress Representative for other packages availability.

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENT

Stress/Test	Test Condition (Temp/Bias)	Result P/F
High Temperature Operating Life Early Failure Rate	Dynamic Operating Condition, Vcc Max=5.5V, 125℃, 96 Hrs	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max=5.5V, 125℃, 1000 Hrs	P
High Temperature Steady State life	125℃, 5.5V, Vcc Max , 336 Hrs	P
Low Temperature Operating Life	-30℃, 5.5V, 500 Hrs	P
High Accelerated Saturation Test (HAST)	130℃, 5.25V, 85%RH Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs, 85C/85%RH+3IR-Reflow, 260℃+0, -5℃	P
Temperature Cycle	MIL-STD-883C, Method 1010, Condition C, -65℃ to 150℃ Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs, 85C/85%RH+3IR-Reflow, 260℃+0, -5℃ Precondition: JESD22 Moisture Sensitivity Level 3 192 Hrs, 30C/60%RH+3IR-Reflow, 260℃+0, -5℃	P
Pressure Cooker	121℃, 100%RH, 15 Psig Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs, 85C/85%RH+3IR-Reflow, 260℃+0, -5℃ Precondition: JESD22 Moisture Sensitivity Level 3 192 Hrs, 30C/60%RH+3IR-Reflow, 260℃+0, -5℃	P
Acoustic Microscopy	J-STD-020	P
Age Bond Strength	200C, 4hrs MIL-STD-883, Method 883-2011	P
Data Retention	150℃ ± 5℃ Non- Bias, 1000 Hrs	P
Dynamic Latch-up	125C, 8.0V	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V/1,1500V/3,300V/400V Method A114-B	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V MIL-STD-883, Method 3015.7	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	250V/500V/750V , JESD22-C101C	P
Endurance Test	JESD22-A117A	P
Static Latch-up	125C, 7.88V / 9.5V, ± 200mA / ± 240mA In accordance with JEDEC 17.	P

RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Thermal[3] A.F	Failure Rate
High Temperature Operating Life Early Failure Rate[1]	1,500 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life[1, 2] Long Term Failure Rate	840,000DHRs	0	0 .7	55	20 FIT

[1] Assuming an ambient temperature of 55C and a junction temperature rise of 15C.
[2] Chi-squared 60% estimations used to calculate the failure rate.
[3] Thermal Acceleration Factor is calculated from the Arrhenius equation

$$AF = \exp\left[\frac{E_A}{k}\left[\frac{1}{T_2} - \frac{1}{T_1}\right]\right]$$

Where:

E_A =The Activation Energy of the defect mechanism.
k = Boltzmann's constant = 8.62×10^{-5} eV/Kelvin.
T_1 is the junction temperature of the device under stress and T_2 is the junction temperature of the device at use conditions.

Reliability Test Data

QTP #: 060605

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC, MSL1							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	COMP	15	0	
CY8C24494 (8C24494A)	9623715	*610635580*	PHIL-M	COMP	15	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	COMP	15	0	
STRESS: AGE BOND STRENGTH							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	COMP	10	0	
CY8C24494 (8C24494A)	9623715	*610635580*	PHIL-M	COMP	10	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	COMP	10	0	
STRESS: DATA RETENTION, PLASTIC, 150C							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	336	256	0	
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	1000	256	0	
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	1500	256	0	
CY8C24494 (8C24494A)	9623715	*610635580*	PHIL-M	336	256	0	
CY8C24494 (8C24494A)	9623715	*610635580*	PHIL-M	1000	256	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	336	256	0	
STRESS: ENDURANCE							
CY8C24494 (8C24494A)	9621713	*610632687A*	PHIL-M	COMP	47	0	
STRESS: ESD-CHARGE DEVICE MODEL, (500V)							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	COMP	9	0	
CY8C24494 (8C24494A)	9623715	*610635580*	PHIL-M	COMP	9	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	COMP	9	0	
CY8C24494 (8C24494A)	9623715	*610635880*	PHIL-M	COMP	9	0	
CY8C24494 (8C24795A)	9623716	*610639349*	SEOL-L	COMP	9	0	
CY8C24494 (8C24995A)	9623716	*610639350*	SEOL-L	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, (2,200V)							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	COMP	9	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	COMP	9	0	
CY8C24494 (8C24494A)	9623715	*610635880*	PHIL-M	COMP	9	0	
CY8C24494 (8C24995A)	9623716	*610639350*	SEOL-L	COMP	9	0	

Reliability Test Data

QTP #: 060605

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, (2,200V)							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	COMP	3	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	COMP	3	0	
CY8C24494 (8C24494A)	9623715	*610635880*	PHIL-M	COMP	3	0	
CY8C24494 (8C24995A)	9623716	*610639350*	SEOL-L	COMP	3	0	
STRESS: STATIC LATCH-UP TESTING (125C, 8.5V, +/-200mA)							
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	COMP	3	0	
CY8C24494 (8C24994A)	9621713		C-USA	COMP	3	0	
CY8C24494 (8C24494A)	9623715	*610638054*	SEOL-L	COMP	3	0	
CY8C24494 (8C24995A)	9623716	*610639350*	SEOL-L	COMP	3	0	
STRESS: DYNAMIC LATCH-UP (125C, 8.5V)							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	COMP	2	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (125C, 5.5V, Vcc Max)							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	96	1005	0	
CY8C24494 (8C24494A)	9623715	*610635580*	PHIL-M	96	1144	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	96	908	1	CAPACITOR DEFECT
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (125C, 5.5V, Vcc Max)							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	168	180	0	
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	1000	1800		
CY8C24494 (8C24494A)	9623715	*610635580*	PHIL-M	168	180	0	
CY8C24494 (8C24494A)	9623715	*610635580*	PHIL-M	1000	180	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	168	180	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	1000	180	0	
CY8C24494 (8C24494A)	9623716	*610639767A*	PHIL-M	1000	180	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST (125C, 5.5V)							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	168	80	0	
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	336	80	0	
STRESS: LOW TEMPERATURE DYNAMIC OPERATING LIFE, -30C, 5.5V							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	500	45	0	

Reliability Test Data

QTP #: 060605

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 5.25V), PRE COND 168 HR 85C/85%RH (MSL1)							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	128	49	0	
CY8C24494 (8C24494A)	9623715	*610635580*	PHIL-M	128	49	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	128	49	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH), 15 Psig, PRE COND 168 HR 85C/85%RH (MSL1)							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	168	50	0	
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	288	50	0	
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	500	47	0	
CY8C24494 (8C24494A)	9623715	*610635580*	PHIL-M	168	50	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	168	50	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	288	50	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 168 HRS 85C/85%RH (MSL1)							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	300	50	0	
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	500	50	0	
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	1000	50	0	
CY8C24494 (8C24494A)	9623715	*610635580*	PHIL-M	300	50	0	
CY8C24494 (8C24494A)	9623715	*610635580*	PHIL-M	500	49	0	
CY8C24494 (8C24494A)	9623715	*610635580*	PHIL-M	1000	49	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	300	50	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	500	49	0	

Reliability Test Data

QTP #: 082201

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: AGE BOND STRENGTH							
CY8C22545 (8C22545A)	5828000	610838762	CML-R	COMP	3	0	
STRESS: DATA RETENTION, PLASTIC, 150C							
CY8C22545 (8C22545A)	5828000	610838762	CML-R	500	85	0	
CY8C22545 (8C22545A)	5828000	610838762	CML-R	1000	85	0	
STRESS: ENDURANCE							
CY8C22545 (8C22545A)	5828000	610838762	CML-R	168	76	0	
STRESS: ESD-CHARGE DEVICE MODEL, (250V)							
CY8C22545 (8C22545A)	5828000	610838762	CML-R	COMP	3	0	
STRESS: ESD-CHARGE DEVICE MODEL, (500V)							
CY8C22545 (8C22545A)	5828000	610838762	CML-R	COMP	3	0	
STRESS: ESD-CHARGE DEVICE MODEL, (750V)							
CY8C22545 (8C22545A)	5828000	610838762	CML-R	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, (1,500V)							
CY8C22545 (8C22545A)	5828000	610838762	CML-R	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, (2,200V)							
CY8C22545 (8C22545A)	5828000	610838762	CML-R	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, (3,300V)							
CY8C22545 (8C22545A)	5828000	610838762	CML-R	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, (4,000V)							
CY8C22545 (8C22545A)	5828000	610838762	CML-R	COMP	3	0	
STRESS: STATIC LATCH-UP TESTING (125C, 7.88V, +/-200mA)							
CY8C22545 (8C22545A)	5828000	610838762	CML-R	COMP	3	0	
STRESS: STATIC LATCH-UP TESTING (125C, 9.5V, +/-240mA)							
CY8C22545 (8C22545A)	5828000	610838762	CML-R	COMP	3	0	
STRESS: DYNAMIC LATCH-UP (125C, 8.0V)							
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (125C, 5.5V, Vcc Max)							
CY8C22545 (8C22545A)	5828000	610838762	CML-R	96	1500	0	

Reliability Test Data

QTP #: 082201

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (125C, 5.5V, Vcc Max)							
CY8C22545 (8C22545A)	5828000	610838762	CML-R	168	120	0	
CY8C22545 (8C22545A)	5828000	610838762	CML-R	1000	120	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (125C, 5.5V, Vcc Max)							
CY8C22545 (8C22545A)	5828000	610838762	CML-R	PRE	20	0	
CY8C22545 (8C22545A)	5828000	610838762	CML-R	POST	20	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH), 15 Psig, PRE COND 192 HR 30C/60%RH, MSL3)							
CY8C22545 (8C22545A)	5828000	610838762	CML-R	168	77	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 192 HRS 30C/60%RH, MSL3)							
CY8C22545 (8C22545A)	5828000	610838762	CML-R	500	76	0	
CY8C22545 (8C22545A)	5828000	610838762	CML-R	1000	76	0	

Reliability Test Data

QTP #: 084611

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-CHARGE DEVICE MODEL, (500V)							
CY8C22545A (8C22545A)	5830014	610849189	CML-R	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, (2,200V)							
CY8C22545A (8C22545A)	5830014	610849189	CML-R	COMP	8	0	
STRESS: STATIC LATCH-UP TESTING (125C, 7.88V, +/-200mA)							
CY8C22545A (8C22545A)	5830014	610849189	CML-R	COMP	6	0	

Reliability Test Data

QTP #: 085103

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-CHARGE DEVICE MODEL, (500V)							
CY8C22545 (8C22545AK)	5850000	610900643	CML-R	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, (2,200V)							
CY8C22545 (8C22545AK)	5850000	610900643	CML-R	COMP	8	0	
STRESS: STATIC LATCH-UP TESTING (125C, 7.88V, +/-200mA)							
CY8C22545 (8C22545AK)	5850000	610900643	CML-R	COMP	6	0	

Document History Page

Document Title: QTP#082201: PSoC Neon Device Family "CY8C22045/2545/2345/1345" S4AD-5 Technology, GSMC
Document Number: 001-88081

Rev.	ECN No.	Orig. of Change	Description of Change
**	4038957	HSTO	Initial Spec Release Qualification report published on Cypress.com is documented on memo HGA-813 and was transferred to qualification report spec template. Deleted Cypress obsolete referenced spec in Major package qualification details. Updated package availability based on current qualified test & assembly site. Deleted Cypress reference Spec and replaced with Industry Standards in Reliability Test Performed Table.
*A	4432506	HSTO	Align qualification report based on the new template in the front page

Distribution: WEB

Posting: None